

WHAT IS CLAIMED IS:

1. A method of forming a metal line of a semiconductor device, comprising the steps of:

forming an interlayer insulating film on a semiconductor substrate;

5 forming a metal line shaped pattern by etching the interlayer insulating film;

forming a diffusion stopper film in conformity with a whole surface of a resultant material in which the metal line shaped pattern is formed;

forming a copper film on the diffusion stopper film;

10 forming a copper metal line by chemically and mechanically polishing the copper film and the diffusion stopper film above the interlayer insulating film;

attaching a titanium metal or a ruthenium metal to only the copper metal line selectively; and

15 annealing the attached titanium metal or ruthenium metal.

2. The method according to Claim 1, wherein the step of attaching the ruthenium metal is performed by dipping the copper metal line into a ruthenium chloride ( $\text{RuCl}_3$ ) solution.

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3. The method according to Claim 1, wherein the step of attaching the titanium metal is performed by dipping the copper metal line into a solution containing titanium chloride ( $\text{TiCl}_4$ ) and hypo-phosphorous acid ( $\text{H}_3\text{PO}_2$ ).

4. The method according to Claim 1, wherein the annealing step is performed under an atmosphere containing nitrogen ( $N_2$ ), hydrogen ( $H_2$ ), or argon (Ar) gases, at a temperature of 200 °C to 400 °C, and for 1 to 3 hours.

5            5. The method according to Claim 1, further comprising a step of forming a capping film after the annealing step.

6. The method according to Claim 1, wherein the capping film is formed of a silicon nitride film ( $Si_3N_4$ ) or a silicon carbide film (SiC).

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